Recognising and explaining functional neurological disorder

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PRACTICE POINTER

Recognising and explaining functional neurological disorder

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What you need to know

- Functional neurological disorder (FND) is associated with considerable distress and disability. The symptoms are not faked
- Diagnose FND positively on the basis of typical clinical features. It is not a diagnosis of exclusion
- FND can be diagnosed and treated in presence of comorbid, pathophysiologically defined disease
- Psychological stressors are important risk factors but are neither necessary nor sufficient for the diagnosis

Functional disorders are conditions whose origin arises primarily from a disorder of nervous system functioning rather than clearly identifiable pathophysiological disease—such as irritable bowel syndrome, fibromyalgia, and functional neurological disorder (FND)—they are the second commonest reason for new neurology consultations.[1] FND is common in emergency settings,[2] stroke,[3] and rehabilitation services.[4] It causes considerable physical disability and distress, and often places an economic burden both on patients and health services.[5] Many clinicians have had little formal clinical education on the assessment and management of these disorders, and patients are often not offered potentially effective treatments.

In practice, FND should be diagnosed by someone with specific expertise in the diagnosis of neurological conditions. Our recommendation is to refer all patients with a suspected diagnosis of FND to secondary care. However, the diagnosis may be raised as a possibility with the patient in primary care, and knowledge of how the diagnosis is confirmed greatly aids subsequent management.

In this article we offer evidence based advice to generalists on how to recognise FND, based on clinical diagnostic and prognostic studies. Although the focus of this paper is on recognising FND, we have included a short box on management to make readers aware that there are good treatments available for FND and that some patients can get better.

Sources and selection criteria

We conducted a PubMed search of evidence for diagnosis of functional neurological disorder (FND) until June 2020, especially systematic reviews.[14 30 31] We also relied on author research paper archives, and a recent international comprehensive textbook on FND (JS and AC were co-editors).[32] The article was reviewed and improved by representatives from five patient organisations: FND Hope, FND Hope UK, FND Action, FND Dimensions, and FND Friends.

What is functional neurological disorder?

FND describes a disorder of the voluntary motor or sensory system with genuine symptoms including paralysis, tremor, dystonia, sensory disturbance (including visual loss), speech symptoms, and seizures. The hallmark is that such symptoms can be positively identified as internally inconsistent or incongruent with recognised pathophysiological disease.

It is not a diagnosis of exclusion

Commonly used synonyms are dissociative neurological symptoms, psychogenic neurological symptoms, and conversion disorder. The DSM-5 definition of FND requires the presence of positive diagnostic features and not just the exclusion of other conditions. In DSM-IV, one of the diagnostic requirements for FND was a recent psychological stressor; however, this was removed in recognition that many patients do not have identifiable stressors.

FND often coexists with other persistent physical symptoms such as dizziness, pain, and fatigue. Patients may also have other functional disorders such as irritable bowel syndrome, fibromyalgia, or chronic pelvic pain.

What are the new concepts in the mechanism and aetiology of functional neurological disorder?

In the past 20 years, developments in the application of neuroscience and the availability of more detailed clinical studies has led to a shift in how we consider the aetiology and mechanism of FND. Previously, FND was always considered to be a consequence of adverse life events such as recent stress or childhood experience. Newer models take account of motor physiology and predictive coding theories. Growing evidence supports the notion that in FND the early pre-conscious phases of motor planning are corrupted by a combination of abnormal involuntary brain-generated predictions about bodily states and interference from more emotionally orientated brain networks such as the limbic system and amygdala.[6-8] For example, signs such as tubular visual field loss (see infographic) can be explained by considering the brain as a largely "predictive" organ which makes and tests predictions about the body rather than constructing perceptions from scratch. In FND it is thought that the brain prioritises excessively strong predictions based on what the brain expects to "see" (such as "tunnel vision") or be able to do (leg weakness) over the actual incoming sensory input.[9]

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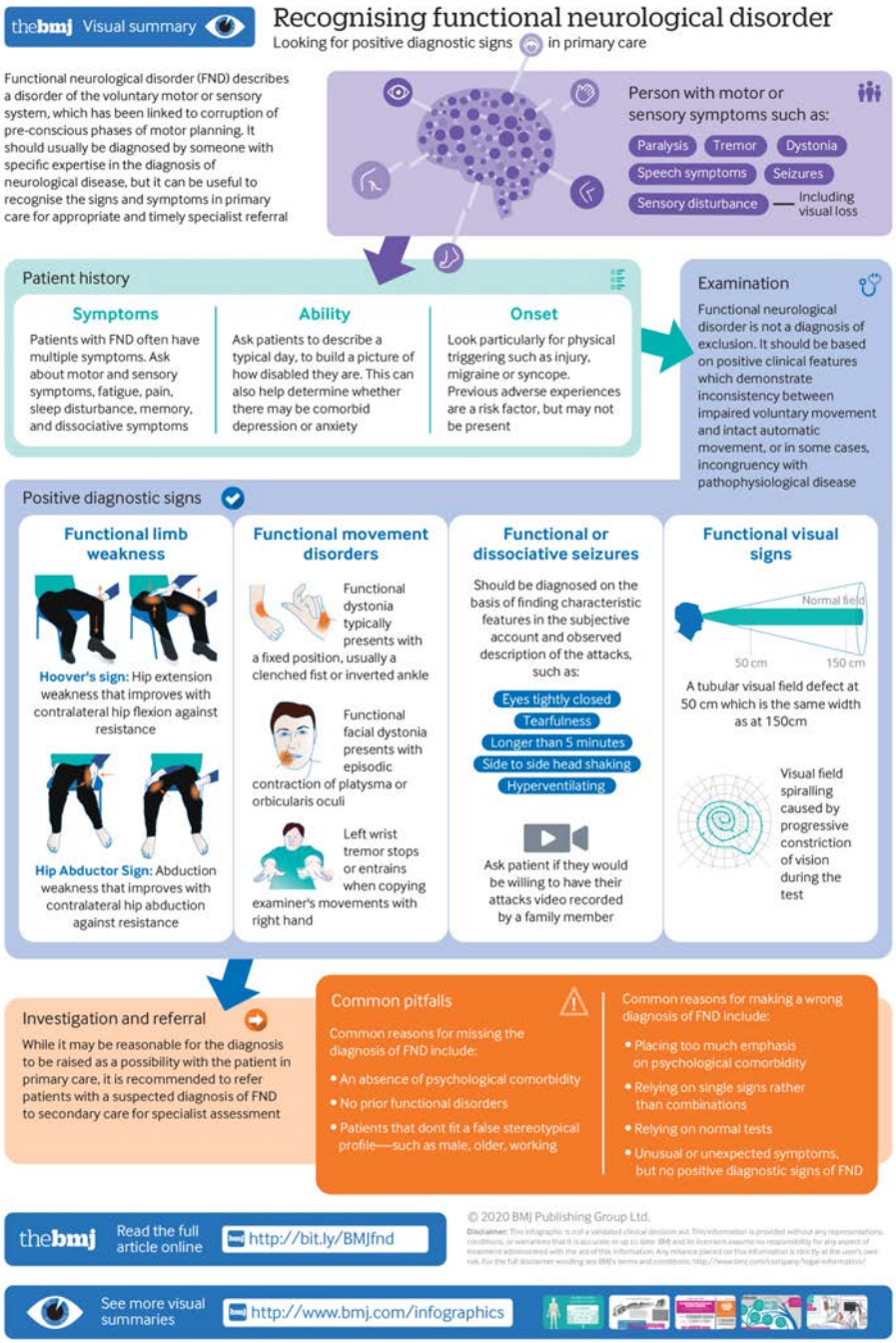
thebmj Visual summary
Recognising functional neurological disorder
Looking for positive diagnostic signs in primary care
Functional neurological disorder (FND) describes a disorder of the voluntary motor or sensory system, which has been linked to corruption of pre-conscious phases of motor planning. It should usually be diagnosed by someone with specific expertise in the diagnosis of neurological disease, but it can be useful to recognise the signs and symptoms in primary care for appropriate and timely specialist referral
Person with motor or sensory symptoms such as:
Paralysis
Tremor
Dystonia
Speech symptoms
Seizures
Sensory disturbance
Including visual loss
Patient history
Symptoms
Patients with FND often have multiple symptoms. Ask about motor and sensory symptoms, fatigue, pain, sleep disturbance, memory, and dissociative symptoms
Ability
Ask patients to describe a typical day, to build a picture of how disabled they are. This can also help determine whether there may be comorbid depression or anxiety
Onset
Look particularly for physical triggering such as injury, migraine or syncope. Previous adverse experiences are a risk factor, but may not be present
Examination
Functional neurological disorder is not a diagnosis of exclusion. It should be based on positive clinical features which demonstrate inconsistency between impaired voluntary movement and intact automatic movement, or in some cases, incongruency with pathophysiological disease
Positive diagnostic signs
Functional limb weakness
Hoover's sign: Hip extension weakness that improves with contralateral hip flexion against resistance
Hip Abductor Sign: Abduction weakness that improves with contralateral hip abduction against resistance
Functional movement disorders
Functional dystonia typically presents with a fixed position, usually a clenched fist or inverted ankle
Functional facial dystonia presents with episodic contraction of platysma or orbicularis oculi
Left wrist tremor stops or entrains when copying examiner's movements with right hand
Functional or dissociative seizures
Should be diagnosed on the basis of finding characteristic features in the subjective account and observed description of the attacks, such as:
Eyes tightly closed
Tearfulness
Longer than 5 minutes
Side to side head shaking
Hyperventilating
Ask patient if they would be willing to have their attacks video recorded by a family member
Functional visual signs
Normal field
50 cm
150 cm
A tubular visual field defect at 50 cm which is the same width as at 150cm
Visual field spiralling caused by progressive constriction of vision during the test
Investigation and referral
While it may be reasonable for the diagnosis to be raised as a possibility with the patient in primary care, it is recommended to refer patients with a suspected diagnosis of FND to secondary care for specialist assessment
Common pitfalls
Common reasons for missing the diagnosis of FND include:
• An absence of psychological comorbidity
• No prior functional disorders
• Patients that dont fit a false stereotypical profile—such as male, older, working
Common reasons for making a wrong diagnosis of FND include:
• Placing too much emphasis on psychological comorbidity
• Relying on single signs rather than combinations
• Relying on normal tests
• Unusual or unexpected symptoms, but no positive diagnostic signs of FND
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Such models acknowledge that previous adverse experiences are a risk factor for the development of FND,[10] but they also explain how symptoms are formed, allow for symptom development in patients who have not had adverse experiences, and help explain why symptoms are often triggered by minor physical trauma or pathophysiological events such as migraine or panic attacks.[11] These models challenge outdated ones that are dependent on a dualistic separation of mind and brain. They present FND as a disorder of a dynamic, plastic brain that constantly modifies its structure and function through interactions with the environment and its interoceptive relationship with the body.[6]

How is a positive diagnosis of functional neurological disorder made?

Diagnosis is based on positive clinical features which typically demonstrate impaired voluntary movement or sensation in the presence of intact automatic movement or sensation, or in some cases, incongruency with pathophysiological disease.

Patient history

Some helpful features of history taking in FND include:

- *List the symptoms*—Patients with FND often have multiple symptoms. As well as asking about motor and sensory symptoms,

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ask about fatigue, pain, sleep disturbance, and memory, and offer patients time to list their physical symptoms.[1]

- *Describe a typical day*—This helps build a picture of how disabled the person is and can help determine whether there may be comorbid depression or anxiety. Asking about good days and bad days can help assess variability.
- *Ask about onset and course,* looking particularly for physical triggering such as injury, migraine, or syncope that may help explain why a particular symptom developed. For example, migraine aura can trigger functional limb weakness, or an unexpected syncope can trigger subsequent dissociative attacks.
- *Ask about dissociative symptoms* such as depersonalisation (a feeling of being disconnected from your own body) and derealisation (a feeling of being disconnected from the world around you).[12] These are common symptoms and can occur at the onset or as part of a dissociative attack. It may be a relief to a patient to discover that their strange experiences have a medical name and are shared by many other people.
- *Use of home video*—For episodic symptoms such as seizures or paroxysmal movement, mobile phone videos (with patient consent) can be helpful for diagnosis.[13]
- *Ideas, concerns, and expectations*—Ask the patient what they and their family or carers think might be wrong, about the experiences they have had with healthcare professionals, and what they think it would be helpful for doctors to do at this point.
- *Asking about stress and adverse life events*—See box 1.

Box 1: Should you ask about adverse life events?

Adverse recent and childhood life events such as abuse are common in the general population and in a range of medical and psychiatric disorders. A systematic review and meta-analysis of 34 case-control studies of functional neurological disorder (FND) found that adverse events are more common in FND than in the general population (with an odds ratio of 2-4), but are certainly not always present, and their presence is not useful diagnostically.[10]

Exploring past traumatic life events may help with individual formulation of aetiology and future treatment, but doing so may also cause distress. Patients with FND who have not had these events may have been sensitised by previous encounters to consider this line of questioning an intrusion into their privacy and an inappropriate search for a psychological cause. Patients with FND who have had adverse experiences may feel they are being blamed for their symptoms by an authority figure, which can recapitulate the traumatising event. If necessary, or if encouraged by the patient, inquire about adverse life events with sensitivity at a pace that is suitable to the patient. It can often wait until follow-up visits.

Clinical features

The diagnosis of FND rests on the demonstration of one or more (usually a combination) of positive physical clinical features, with examples listed below[14]:

Functional limb weakness

- *Hoover's sign* describes weakness of hip extension which returns transiently to normal during contralateral hip flexion against resistance (see fig 1 and infographic). It can be done sitting or lying.
- *The hip abductor sign* describes a similar sign in relation to weakness of hip abduction that returns to normal with contralateral movement (fig 1 and infographic).

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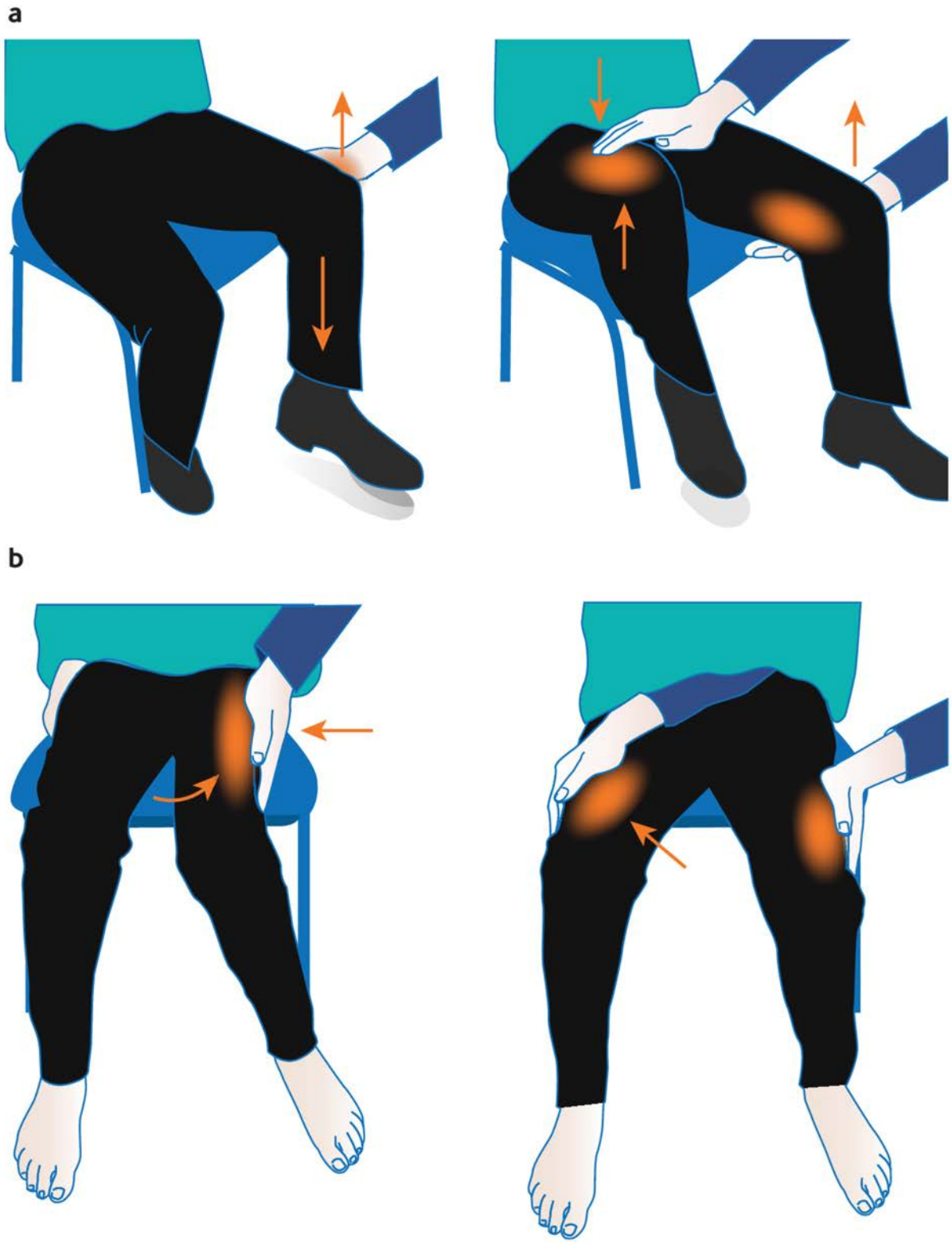

Fig 1 | (a) Hoover's sign of functional leg weakness in functional neurological disorder (FND): hip extension is weak to direct testing (left), but hip extension strength becomes normal with contralateral hip flexion against resistance (right) (adapted from Stone[15]). (b) Hip abductor sign of functional leg weakness in FND: hip abduction is weak to direct testing (left), but strength becomes normal with contralateral hip abduction against resistance (right) (adapted from Stone et al[16])

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Functional movement disorders

- *Functional tremor* is diagnosed by looking for evidence of distractibility with the "entrainment test." Ask the patient to copy rhythmic movements of varying frequency made by the examiner between thumb and forefinger using one hand and then observe the response in the other hand. Cessation of the tremor, "entrainment" to the same rhythm, or inability to copy the movement suggest functional tremor. See fig 2 and infographic.

Fig 2 | Tremor entrainment test of functional tremor in functional neurological disorder. The patient copies the examiner making variable rhythmic pincer movements of thumb and forefinger with their better (right) side. The patient's left sided functional tremor stops during the entrainment task, showing that its distractible (adapted from Roper et al[17]). If the tremor entrains to the same rhythm as the examiner or the patient cannot copy the movement the test is also positive

- *Functional dystonia* typically presents with a fixed position, usually a clenched fist or inverted ankle (see fig 3 and infographic). This is different to other types of dystonia which are usually mobile.
- *Functional facial dystonia* usually presents with episodic contraction of platysma or orbicularis, resulting in a typical appearance (see fig 3 and infographic).

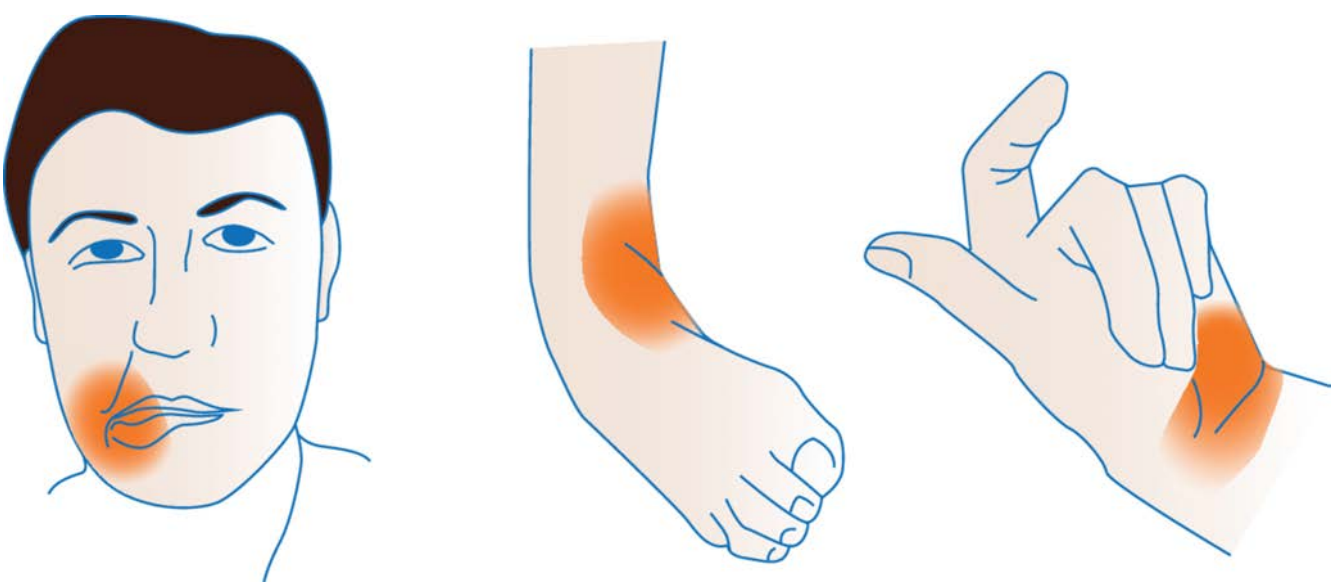

Fig 3 | Functional dystonia typically presents with facial spasm in which there is jaw deviation to one side and contraction of platysma or orbicularis, or a fixed posture with a clenched fist or inverted plantarflexed ankle. Orange shading shows areas of fixed muscular contraction

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Functional or dissociative seizures

These are diagnosed on the basis of characteristic features in the subjective account and observed description of the attacks.

Subjective descriptions often include symptoms of autonomic arousal such as palpitations, warmth, and sweating, as well as dissociative experiences (with or without fear). These often only last seconds and are often not recalled; they are not diagnostic of functional seizures, but knowledge of them can help guide management. For example, a person might be dissociating as a conditioned response to unpleasant autonomic arousal, and learning distraction techniques to gain control (in a similar way to panic attacks) can be helpful.

Objective features—demonstrated in a systematic review of the specificity and sensitivity of various clinical signs of functional seizures versus epilepsy in 34 studies—include the eyes being tightly closed, tearfulness, duration more than 5 minutes, hyperventilation during a seizure, and side to side head shaking (see table 1 and infographic).[18] Around 30% of patients have events that look like syncope.[19] The combination of sudden motionless unresponsiveness with eyes closed for more than 2 minutes is rarely due to another cause. Making a clinical diagnosis requires experience of the range of presentation of epileptic seizures and syncope which may co-exist.

Table 1 | Clinical features that help separate functional seizures in functional neurological disorder (FND) from epilepsy (based on Avbersek et al 2010[18]). Syncope usually lasts less than 30 seconds and with eyes open. Clinical features usually need to be assessed in combination. A smartphone video taken by a friend or family member with consent may help

Clinical feature	Common in FND and rare in epilepsy or syncope	Common in epilepsy and rare in FND	May be present in either
Eyes Closed during event	Yes	—	—
Resistance to eyelid opening	Yes	—	—
Duration longer than 2 minutes	Yes	—	—
Hyperventilation during episode	Yes	—	—
Crying after the event	Yes	—	—
Guttural Cry at onset	—	Yes	—
Stertorous (snoring) breathing after the event	—	Yes	—
Synchronous EEG evidence of epilepsy	—	Yes (although interictal EEG often normal)	—
Report of tongue biting	—	—	Yes
Urinary incontinence	—	—	Yes

EEG = electroencephalogram.

Functional visual loss.

Characteristic features include tubular (rather than conical) vision, so visual field at 150 cm distance is the same width as at 50 cm. The laws of physics mean that the diameter of a field should increase conically with distance (see fig 4 and infographic). Patients may also demonstrate visual field "spiralling" on Goldmann perimetry (fig 4 and infographic)—the longer the test goes on, the more constricted the person's visual field becomes

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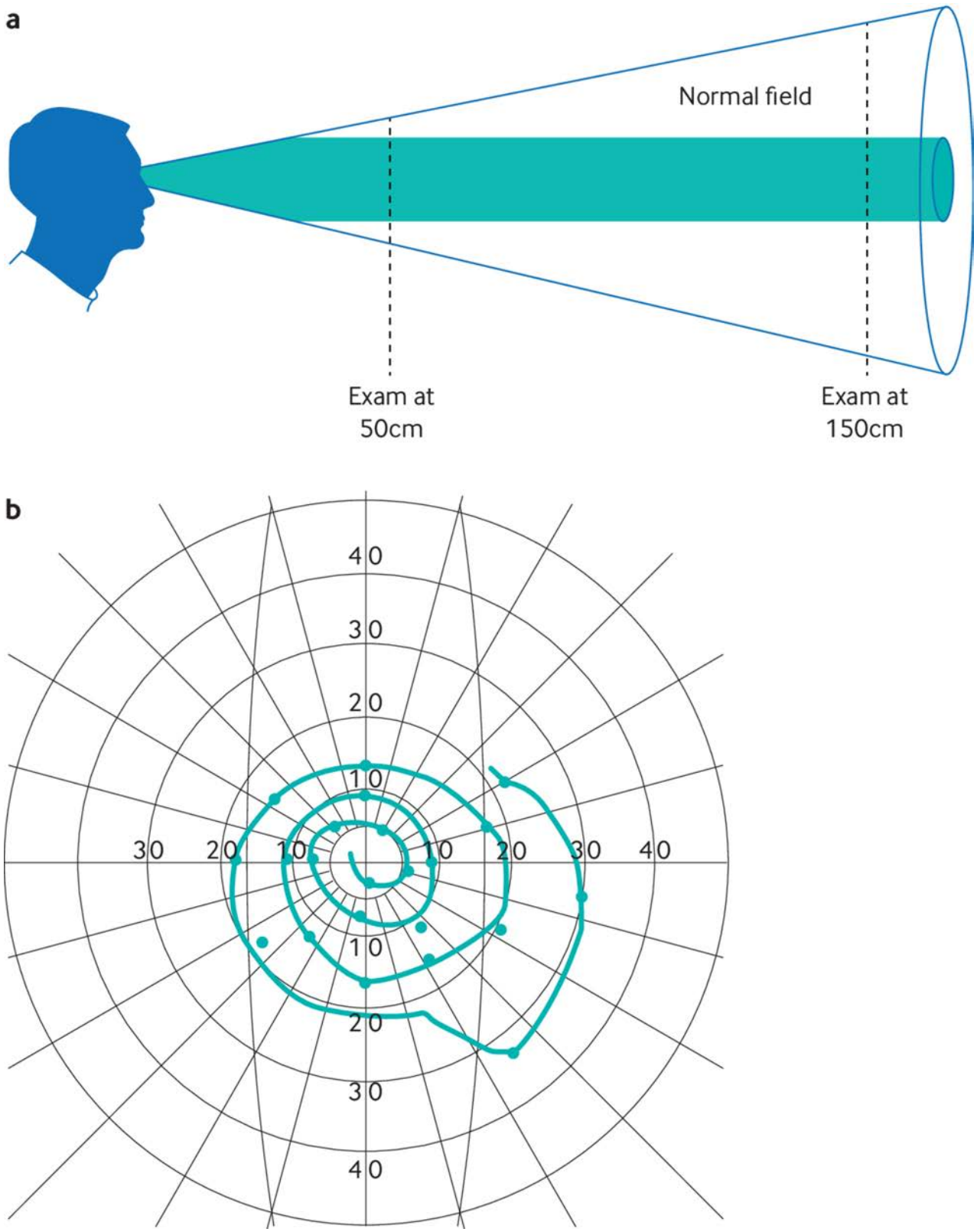

Fig 4 | (a) Functional visual loss can be detected at the bedside by finding a tubular visual field defect at 150 cm which is the same width as at 50 cm. (b) Spiralling of visual fields on Goldmann perimetry occurs when the subject's vision becomes more constricted the longer the test goes on

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When are investigations for pathophysiological disease comorbidity necessary?

Always consider whether patients with signs and symptoms of FND could also have pathophysiological disease, and be willing to make two diagnoses if appropriate. For example, someone may have multiple sclerosis, but their disability may be coming predominantly from FND.[20] Other contributing neurological and medical problems such as vitamin B12 or thyroid deficiency, migraine, hypermobility spectrum disorders, or carpal tunnel syndrome are also common, and around 20% of patients with functional seizures as part of FND also have epilepsy.[21] Therefore, routine blood tests and assessment for some of these common disorders may be helpful when waiting for a neurological review.

FND can be a relapsing remitting condition, but other new conditions can occur at any stage. If new neurological symptoms develop in someone with diagnosed FND, consider whether they are likely to be related to the FND diagnosis or if they are unrelated. Offer an unbiased assessment and ask for a neurological review when there is doubt.

Arrange appropriate laboratory, radiological, or neurophysiological investigations even when there is clear evidence of FND; however, remain aware that, in asymptomatic individuals undergoing cranial neuroimaging, one in six individuals has an incidental abnormality, the discovery of which may cause more harm and worry.[22] Incidental findings on spinal imaging, such as disc prolapse, in asymptomatic individuals occur at a percentage similar to a patient's age.[23] Therefore, to reduce patient concern, when FND is clinically the most likely diagnosis, consider informing patients in advance that tests for pathophysiological disease are likely to be negative or might show these incidental changes.

Video electroencephalography, especially with an induction protocol, allows a video recording of typical features and helps to exclude epilepsy occurring in addition to functional seizures.

Avoid diagnosing FND on the basis that investigations for other conditions are negative and consider that FND may still be present even when investigations for other conditions are positive.

What are the diagnostic pitfalls of functional neurological disorder?

A systematic review showed that the mean proportion of patients receiving an incorrect diagnosis of FND in studies between 1970 and 2003 was 4%,[24] which is similar to most neurological and psychiatric disorders. Furthermore, it seems to be just as common for FND to be misdiagnosed as neurological disease[25]; this is often viewed by clinicians as a lesser problem, but patients misdiagnosed with multiple sclerosis or Alzheimer's disease may disagree. There is no room for complacency in either direction

Common reasons for making a wrong diagnosis of FND include placing emphasis on psychological comorbidity; making judgments that symptoms, especially gait and "episodes" are "bizarre" without considering whether they are typical of FND; relying on single signs rather than combinations of features; and placing reliance on normal laboratory or radiological investigations for recognised pathophysiological disease.

Conversely, common reasons for missing the diagnosis of FND include assuming that it cannot be the diagnosis in a patient with no psychological comorbidity or no prior functional disorders, or in a patient who goes against false stereotypes about functional disorders—for example, a patient who is male, older, and working.

Which functional disorder and psychological comorbidities may be present?

Other functional symptoms and disorders, especially those involving chronic pain, fatigue, and memory symptoms are common in patients with FND of all types, and in many patients these symptoms determine quality of life more than motor or sensory symptoms.[26]

Psychological comorbidities—especially anxiety, panic, and depression—are common, affecting over 50% of patients,[27] and are often worsened by the disability of the condition. Some patients will have had adverse experiences, but, importantly, these are neither necessary nor sufficient for the diagnosis.

Falsification of symptoms, as seen in factitious disorder or malingering, may lead to similar clinical features to FND but is acknowledged to be rare. Specifically excluding it is no longer part of the diagnosis of FND in DSM-5.[28] Consider wilful exaggeration if there is repeated evidence of lying or a major discrepancy between reported and observed function, but not if there is self reported variability in function as this is typical of FND,

How can the diagnosis of functional neurological disorder be explained?

A successful conversation about the diagnosis of the FND leaves the patient with a reasonable degree of confidence and understanding and is an essential platform for further treatment.

As with the delivery of the diagnosis of any disorder, include sufficient time, take the problem seriously, give the name of the condition, provide further reading information (such as www.neurosymptoms.org, www.nonepilepticattacks.info), and offer sources of support such as patient support groups (such as https://fnd-hope.org/, www.fndaction.org.uk, http://fnddimensions.org/, https://fndfriends.com/).[29]

Demonstrating positive clinical signs of FND can be especially helpful provided it is done as a way of helping the patient gain insight into the mechanism of their symptoms, as opposed to an approach that suggest a diagnosis of exclusion or that there is "no problem." It may also lead naturally to therapies. For example, if someone can be helped to see that their weak leg does return transiently normal during testing for Hoover's sign, or that their tremor transiently stops during an entrainment test, this offers a window on what may be possible with physiotherapy to "retrain the brain." The use of analogy, for example, that this a "software rather than hardware problem" or, for FND seizures, that there is a "red alert state which the brain has learnt to switch off automatically by going into a trance like state" can help translate neuroscience to the bedside.

Where explanation fails, it is common to find that the normal "rules" and expectations of a consultation are broken[29]: for instance, by focusing on what the person doesn't have, not giving a diagnosis, or jumping prematurely to conclusions about aetiology, especially psychological factors.

FND is not an easy diagnosis for a patient or their family and friends to understand, and some patients may not agree that its correct. Explanation may need to be repeated by the neurologist, members of a multidisciplinary team, and in primary care, ensuring that everyone understands the correct rationale for it.

Management of functional neurological disorder

Evidence from randomised clinical trials supports the role of specific physiotherapy for functional motor symptoms,[33 34] and specialised

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cognitive behavioural therapy[19] across the range of FND, as well as multidisciplinary rehabilitation for refractory cases.[4]

The management of FND takes place in both primary and secondary care and is often multidisciplinary. We have looked at the care of individual patients in this article, but considerations need to be made at the level of healthcare systems too. Few healthcare systems plan well for this group of patients, which leads to missed opportunity, iatrogenesis, frustration for patients and clinicians, and poor use of resources.[35]

Diagnosing and explaining functional neurological disorder

A 28 year old man develops left leg paralysis and numbness gradually after a minor but painful ankle injury. He has felt dismissed and unbelieved by doctors, who have implied it was all in his head. He had a difficult upbringing and was frustrated but not depressed.

- *Make a diagnosis*—There was clear positive evidence of a diagnosis of FND with a pattern of weakness and physical signs including Hoover's sign that is only found in this condition.
- *What is it? Explain there is a name and it is a "rule-in" diagnosis*—"You have typical symptoms and signs of functional neurological disorder. Did you notice that the strength in the leg came back to normal briefly when you lifted up the other leg? Shall I show you that again?"
- *How? Talk about mechanism first*—"The physical signs of FND show that there is a potentially reversible problem with the software of the nervous system, the brain has got stuck with a faulty movement programme, but the hardware of the brain is OK."
- *Why? It's complicated*—There is no need to rush to try to understand everyone's vulnerability. Some patients have little to find, others a lot. Explore that at the patient's pace, not yours. Think of how you would explain the cause of stroke in a former smoker or non-smoker. Don't turn a risk factor into the "cause" of the problem.
- *What about a scan?*—It is important to consider other investigations, as people with FND often have other medical conditions that can trigger or increase their vulnerability to the disorder.
- *Treatment*—Physiotherapy can help "retrain the brain" so that movements become gradually more automatic and normal again. Psychological therapy may help address FND symptoms directly (as well as understanding what's happened) and address anxiety or mood to make it less likely to recur.

Education into practice

- What is your attitude to patients with functional neurological disorder?
- How much importance do you put on psychological features when considering a diagnosis?
- How do you explain that tests you are ordering are likely to be normal?
- Think about a recent patient you saw with FND: how did you explain their symptoms or diagnosis to them? What might you do differently next time?

How patients were involved in the creation of this article

The article was reviewed and improved by representatives from five patient organisations: FND Hope, FND Hope UK, FND Action, FND Dimensions, and FND Friends. They made many incorporated suggestions, especially focusing on language that promotes an aetiologically neutral approach which is not blaming or presupposing psychological causation and emphasising need to evaluate new symptoms without prejudice.

Contributors: JS drafted the manuscript, CB and AC revised the script. The manuscript was reviewed by Dawn Golder (FND Hope UK), Bridget Mildon (FND Hope), Emma Clark (FND Friends), Kim Hearne (FND Action), and Steven Webster (FND Dimensions).

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